

# 11-1 Arithmetic Sequences

sequence--list of numbers in a particular order

numbers--terms

arithmetic sequence--sequence in which each term after the first is found by adding a constant to the previous term

constant--common difference (d)

ex:

18, 38, 58, 78, 98, ...

$$d = 20$$

$$a_1 = 18$$

$$a_2 = 38$$

$$a_3 = 58$$

$$a_6 = 118$$

Recursive--find a term using the previous term

$$a_n = a_{n-1} + d$$

$$a_6 = a_5 + d$$

Explicit--find a specific term using the first term

ex:

11, 15, 19, 23, 27

$$a_1 = 11$$

$$a_2 = 15$$

$$d = 4$$

$$a_2 = 11 + 4 = 15$$

$$a_3 = 11 + 2 \cdot 4 = 19$$

$$a_4 = 11 + 3 \cdot 4 = 23$$

$$a_5 = 11 + 4 \cdot 4 = 27$$

$$a_6 = 11 + 5 \cdot 4 = 31$$

$$\begin{matrix} a_3 & a_n \\ a_2 & a_{n-1} \end{matrix}$$

$$a_n = a_1 + (n-1)d$$

Explicit formula

n is an integer

$$a_n = a_1 + (n-1)d$$

ex:

12, 5, -2, -9

Find  $a_n = a_1 + (n-1)d$   
 $d = -7$   
 $a_n = 12 + (n-1)(-7)$   
 $a_{10} = 19 - 7(10)$   
 $-51$   
 $a_n = 19 - 7n$

ex:

$$a_1 = 23 \quad d = -5$$

Find  $a_n$   $a_n = 23 + (n-1)(-5)$

Find  $a_5 = 3$   $a_n = 28 - 5n$

Find  $a_{21} = -77$

Do:

1. Find  $a_n$ 

-3, -10, -17, -24, ...

$$a_n = 4 - 7n$$

2. 3, 11, 19, ...

Find  $a_{31}$ 

$$a_{31} = 3 + 30(8)$$

$$= 243$$

3. 100, 98, 96, ...

Find  $a_{25}$ 

$$a_{25} = 100 + 24(-2)$$

$$= 52$$

Arithmetic Mean(s)--term(s) between any two terms in a sequence

ex:

12, 18, 24, 30, 36

18 is the arithmetic mean between 12 and 24

24, 30 are the arithmetic means between 18 and 36

ex:

Find 3 arithmetic means between 13 and 29

13, 17, 21, 25, 29

$$a_1 = 13$$

$$a_5 = 29$$

$$a_n = a_1 + (n-1)d$$

$$29 = 13 + (5-1)d$$

$$16 = 4d$$

$$4 = d$$

Do:

Find 2 arithmetic means between 6 and 27

6, 13, 20, 27

$$d = 7$$

ex:

$$a_1 = \underline{-8}$$

$$a_4 = 16$$

$$a_7 = 40$$

$$16 = a_1 + (4-1)d$$

$$a_n = a_1 + (n-1)d$$

$$a_7 = a_4 + (7-4)d$$

$$40 = 16 + 3d$$

$$24 = 3d$$

$$8 = d$$

Do:

$$a_1 = \underline{-50}$$

$$a_6 = 5 \quad a_9 = a_6 + (9-6)d$$

$$a_9 = 38 \quad a_1 = -50 \quad d = 11$$

What term is 731?

$$a_n = 731$$

$$n = \underline{72} \quad 731 = -50(n-1) + 11$$

HW

p581

15-39odd